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Method and apparatus for fabricating an injection molded article on whose outer circumferential area an application, for example a label, is arranged.

The invention relates to a method according to the preamble of claim 1 and an apparatus according to the preamble of claim 2.

From EP 802 032, there are known a method and an apparatus of this kind for injection molding a beaker having a label on the outer circumference. Fig. 1 shows, in step a, the taking up of a label 1 by a truncated cone-shaped transfer tool 2 from a pile of labels 1', wherein the truncated cone, which is provided on the outer circumference with an electrically conductive layer and vacuum bores, is rolled onto the label using vacuum application, so that the label abuts around the circumference of the truncated cone as shown in step b. Hereupon, in step c the label is transferred into a mold cavity 3 of an injection molding tool 4 of the injection molding machine, wherein after insertion of the truncated cone-shaped transfer tool in the mold cavity, voltage is applied to this tool such that the label is electrostatically charged and fixedly held on the inner circumferential area of the mold cavity by the electrostatic charge. Hereupon, in step d the transfer tool is moved back out of the mold cavity 3, in which the label 1 remains, whereupon the mold is closed and the injection molding process can be carried out.

In this known method, the transfer tool requires a certain amount of time for rolling the label before the transfer tool can be moved into the mold cavity, while the injection molding process itself proceeds relatively quickly. Therefore the injection mold must be passively held in readiness for a certain time while the label is rolled onto the transfer tool and delivered to the mold cavity. Due to this long cycle rate for taking up and rolling the label by means of the transfer tool in relation to the cycle rate of the injection molding machine, the capacity of the latter cannot be fully exploited.

The invention is based on the object of adapting a method of the type given above such that the capacity of the injection molding machine can be better exploited. Further, an apparatus

is to be proposed by means of which an increase in capacity of the injection molding machine can be achieved.

This object is solved for the method by the features in the characterizing part of claim 1. Before the label is positioned on the circumference of the transfer tool, it is moved into a preforming means and shaped for insertion into the mold cavity. This allows the transfer tool to receive the label from the preforming means and transfer it to the mold cavity at a fast cycle rate, so that during the transfer of a label from the preforming means to the mold cavity of the injection molding tool, a further label can already be preformed in the preforming means and held in readiness to be taken up by the transfer tool. Altogether, the provision of a preforming process of the label allows a higher cycle rate to be used, which allows the injection molding machine to work at a high capacity.

The object of increasing the capacity of an injection molding machine is solved by a preforming means by means of which the label is preformed before being transferred into the mold cavity, so that it can be merely taken over by the transfer tool and delivered to the mold cavity without any loss of time.

An exemplary embodiment of the invention is explained in more detail below with reference to the drawing, in which

Fig. 1 shows the individual steps for transferring a label into the mold cavity using the known method,

Fig. 2 shows a corresponding representation of the sequence of steps for the method according to the invention using a preforming means,

Fig. 3 shows a front view of the preforming block, and

Fig. 4 shows schematically a supporting core in the preform.

In contrast to the known method shown in Fig. 1 in which the transfer tool itself brings the label into the shape in which it can then be inserted in the mold cavity 3, in the method according to the invention in an extra step the label is preformed such that it can be merely taken up by the transfer tool and inserted into the mold cavity 3 of the injection molding tool 4.

Fig. 2 schematically shows the procedure for this method. Firstly, a gripper 10, which is for example vacuum-applied, takes a label 1 from a pile of labels 1' and transfers it in the direction of the arrow to a preforming means 11 having a sector-shaped plate 12. On this plate 12 circular arc-shaped guideways 13 are formed, in which vacuum-applicable grippers (not shown) are displaceably guided for taking over the label 1 from the gripper 10 and guiding it to a forming block 14, whose preform cavity 15 corresponds to the mold cavity 3 of the injection molding tool 4. The forming block 14 is provided adjacent to the guideways 13 with a slit 16 extending in the axial direction of the preform cavity 15, through which slit the label is introduced into the preform cavity 15, in which it abuts along the truncated cone-shaped inner circumferential wall. As soon as the label is positioned on the inner circumference of the preform cavity 15, the truncated cone-shaped transfer tool 2 is moved into the preform cavity 15, whereupon using vacuum application of the transfer tool 2 the label is taken up and transferred into the mold cavity 3 of the injection molding tool 4. The bores and channels on the transfer tool 2 for vacuum application are not shown in Fig. 2.

While the preformed label is being transferred by means of the transfer tool 2 from the preforming means 11 to the mold cavity 3 of the injection molding machine, a further label can already be picked up from the pile 1' and transferred into the preforming means 11, so that after closing of the injection mold 4 and the injection molding process, a further preformed label is already held in readiness for the transfer tool 2, and altogether a higher cycle rate can be used.

To allow the label 1 to be preformed in a form corresponding to a truncated cone-shaped beaker, the label 1 is cut to the shape of a section of a ring sector is moved onto a circular arc track around a center 17 of a circle, wherein the radius of the guideway 13 corresponds to the radius of the curvature of the label. In other words, the label 1 on the circular arc-shaped guideway 13 represents a development of the inner circumference of the preform cavity 15.

To allow the label to slide along the inner circumference of the preform cavity 15 when inserted in the slit 16 of the forming block 14, a guide sheet (not shown in Fig. 2) can be provided at the slit 16 to serve as a guide for the label. The guideway 13 can extend up to the slit 16 and if necessary also around the inner circumference of the preform cavity, to assist or guarantee the rolling of the label by the gripper guided in the guideway.

It is also possible to form the slit 16 curved so that it opens into the preform cavity 15 approximately tangentially to the inner circumferential wall of the preform cavity 15, to assist the abutting of the label on the inner wall of the preform cavity. Fig. 3 shows an example of an insertion slit 16 curved in this way, in a view of the preform cavity 15 from the side of the engagement of the transfer tool 2.

Instead of the described preforming means 11, depending on another shape of an injection molded article, other preforming means can also be provided. Correspondingly, the provision of a preforming means can also be used for the fabrication of a differently shaped injection molded article on whose outside a label or another application is to be attached.

If, for example, large injection molded articles are provided, such as buckets or injection molded articles having a long side length, for example an approximately rectangular container, then it is advantageous to support the preforming process by an auxiliary means.

Fig. 4 shows a forming block 14' having an approximately rectangular preform cavity 15'. The slit 16 opens along a longitudinal side of the preform cavity for inserting the label 1. So that the label 1 is better guided along the narrow radii at the corners and over the larger sidelengths of the preform cavity, a supporting core 18 is provided which is inserted in the preform cavity 15' only during the preforming procedure. Hereby, along the circumference of the preform cavity 15' a gap is formed, through which the label 1 is guided.

The supporting core 18 can be inserted in the preform and removed again after the preforming process by means of a gripper (not shown), so that the transfer tool 2 can engage for taking up the preformed label. Hereby, the supporting core 18 can be moved in and out through the one or other side of the preform, which is open on both sides.

Fig. 4 shows suction means 19, for example bores, which are vacuum applied and arranged at least partially around the circumference of the preform cavity 15'. After preforming and removal of the supporting core 18, by means of these suction means 19 the label can be held closely abutting on the preform. Such suction means 19 can be provided for example only on the long sides and especially on the narrow radii of the preform cavity 15' in connection with a supporting core 18 or without a supporting core 18.

Applications or labels preformed in other ways can also be inserted in an already preformed state into the preform 14, 15 and then transferred by the transfer tool 2 into the mold cavity 3 of the injection molding tool. In this way, an increase in the cycle rate of the injection molding machine is achieved.